



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/US99/29084 (22) International Filing Date: 07 December1999 (07.12.1999) (30) Priority Data: 09/209,113 10 December1998 (10.12.1998) US (60) Parent Application or Grant GENERAL ELECTRIC COMPANY [/]; O. CIARCIA, Ronald, David [/]; O. PAPALLO, Thomas, Frederick, Jr. [/]; O. CHASKIN, Jay, L. ; O.	Published	
(54) Title: ELECTRONIC CONTROL ARRANGEMENT WITH REMOVABLE MEMORY MODULE (54) Titre: AGENCEMENT DE COMMANDE ELECTRONIQUE AVEC MODULE DE MEMOIRE AMOVIBLE (57) Abstract <p>A control unit for use in an electronic control arrangement that includes a protective device for protecting a load. The control unit may communicate with a separate arrangement controller, and includes a removable non-volatile memory module comprising application specific settings storable thereon and associated with the load, thereby permitting the replacement of the control unit while the memory module from the original control unit, insertable in the replacement control unit, retains all of its application specific settings stored thereon. In an alternative embodiment, the protective device may include the removable non-volatile memory module.</p> (57) Abrégé <p>L'invention concerne une unité de commande pouvant être utilisée dans un agencement de commande électronique qui comprend un dispositif de protection de charge. Ladite unité, qui peut communiquer avec un contrôleur d'agencement séparé, comporte un module de mémoire non volatile amovible. Ce dernier renferme des paramètres spécifiques d'application qu'il peut stocker et qui sont associés à la charge, ce qui permet le remplacement de l'unité de commande, tandis que le module de mémoire de l'unité de commande initiale, que l'on peut introduire dans l'unité de commande de remplacement, conserve en mémoire tous ses paramètres spécifiques d'application. Dans un autre mode de réalisation, le dispositif de protection peut comporter le module de mémoire non volatile amovible.</p>		

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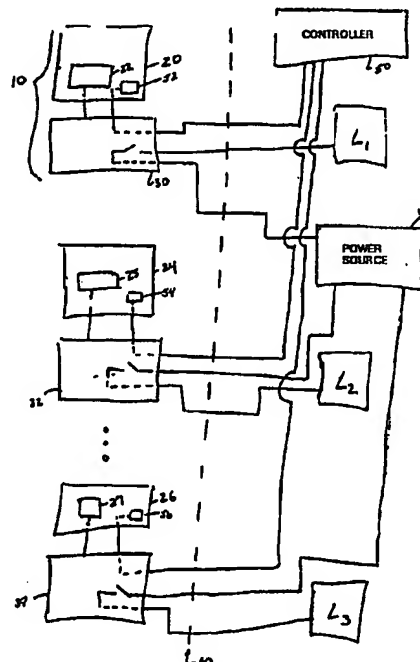
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(21) International Application Number: PCT/US99/29084 (22) International Filing Date: 7 December 1999 (07.12.99) (30) Priority Data: 09/209,113 10 December 1998 (10.12.98) US (71) Applicant: GENERAL ELECTRIC COMPANY [US/US]; 1 River Road, Schenectady, NY 12345 (US). (72) Inventors: CIARCIA, Ronald, David; 5 Mano Lane, Bristol, CT 06010 (US). PAPALLO, Thomas, Frederick, Jr.; 5 Woodside Lane, Plainville, CT 06062 (US). (74) Agents: CHASKIN, Jay, L. et al.; General Electric Company, 3135 Easton Turnpike W3C, Fairfield, CT 06431 (US).		(81) Designated States: CN, HU, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: ELECTRONIC CONTROL ARRANGEMENT WITH REMOVABLE MEMORY MODULE

(57) Abstract

A control unit for use in an electronic control arrangement that includes a protective device for protecting a load. The control unit may communicate with a separate arrangement controller, and includes a removable non-volatile memory module comprising application specific settings storable thereon and associated with the load, thereby permitting the replacement of the control unit while the memory module from the original control unit, insertable in the replacement control unit, retains all of its application specific settings stored thereon. In an alternative embodiment, the protective device may include the removable non-volatile memory module.



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Description

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ELECTRONIC CONTROL ARRANGEMENT WITH REMOVABLE MEMORY MODULE

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BACKGROUND OF THE INVENTION

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The present invention relates generally to electronic control arrangements and in particular, to an improved electronic trip unit or protective device that includes a removable memory module for increased system flexibility.

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Programmable control and protection apparatuses are well known in the art. Known also are attempts to minimize the time and effort associated with replacing the control units used therein in the event the control unit fails. For example, in one early known programmable electronic control and protection apparatus, the control unit, uniquely associated with specific components of the installed apparatus, contained onboard software memory incorporated therein. Such an arrangement has been recognized as less than desirable, since, in such an embodiment, each location address and other application specific setting was held in the memory of the particular control unit. If the control unit or the protective device failed and required replacement, a technician was required to physically reinput the necessary information/parameters/settings in the new control unit since the memory of the failed/damaged control unit was unrecoverable. Such an arrangement was also undesirable since it was therefore prone to inputting errors.

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An attempt at overcoming the foregoing problem is described in U.S. Patent No. 5,672,943. In particular, the '943 patent describes an electronic control apparatus for controlling functional electrical power units. However, the

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apparatus includes replaceable control units and a respective non-volatile memory physically associated with each functional unit, with the logic address of each functional unit being available to the respective control unit and to any replacement control unit.

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The foregoing arrangement still limits the flexibility of the apparatus since the memory module is fixed at the site of the functional units and means for facilitating the reprogramming or modification of the information stored in the memory modules is limited and/or restricted thereby, thus requiring a physical presence at the site for such reprogramming or modification of the physically present memory module.

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It is therefore desirable to provide an electrical control arrangement that includes both an improved control unit and protective device construction that overcomes the aforementioned deficiencies. The present invention disclosed herein achieves the aforementioned and below mentioned objectives.

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SUMMARY OF THE INVENTION

Generally speaking, in accordance with the invention, a control unit for use in an electronic control arrangement that includes a protective device for protecting a load is provided. In the preferred embodiment, the control unit communicates with a controller, such as a G.E. Power Leader™ Power Management Controller, and includes a removable non-volatile memory module, the memory module comprising application specific settings storable thereon and associated with the load. Based thereon, in a novel aspect of the present invention, if the original control unit is removed from the control arrangement and the memory module associated with the original control unit

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is removed therefrom, a replacement control unit can replace the original control unit in the control arrangement and the memory module from the original control unit is insertable into the replacement control unit and the memory module from the original control unit retains all of its application specific settings stored thereon.

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In an alternative embodiment, the protective device may include the removable non-volatile memory module. In a similar way, if the original protective device is removed from a control arrangement, and the memory module associated with the original protective device is removed therefrom, a replacement protective device can replace the original protective device in the control arrangement and the memory module from the original protective device is insertable into the replacement protective device and the memory module from the original protective device retains all of its application specific settings stored thereon.

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Accordingly, it is an object of the present invention to provide an electronic control arrangement that significantly reduces potential damage or destruction of the components thereof by reason of the incorporation of the memory module within the control unit or protective device.

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Another object of the present invention is to provide an electronic control arrangement that includes an electronic control unit comprising a removable non-volatile memory module.

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Another object of the present invention is to provide an electronic control arrangement that includes a protective device comprising a removable non-volatile memory module.

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Another object of the present invention is to provide an electronic control arrangement that incorporates rejection schemes to eliminate the use of an incorrectly configured memory module in the respective control unit or protective device.

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Still another object of the present invention is to reduce the number of accessible and therefore damageable cable connections required within the system, such as the connection between the non-volatile memory and the control unit described in U.S. Patent No. 5,672,943, by incorporating the removable memory module within the control unit or the protective device.

Yet another object of the present invention is to provide a means of permitting the memory module to physically remain with the control unit or protective device, thereby reducing the likelihood that the memory module becomes separated therefrom during shipping or installation, for example.

Still further, an object of the present invention is to provide an improved method of repairing or replacing a control unit and/or a protective device and verifying the calibration and working order thereof, all at a location separate from the remainder loads of the system.

Another object is to provide the ability to have the combination of the memory module contained in the protective device portable and interchangeable with compatible arrangements.

Yet another object of the present invention is to provide flexibility to the system, such as remote programming of the memory module.

Still other objects and advantages of the invention will in part be obvious and will in part be apparent from the specification.

The invention accordingly comprises the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

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For a fuller understanding of the invention, reference is made to the following description taken in connection with the accompanying figures, in which:

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Fig. 1 is a schematic view of a system comprising an electronic control arrangement constructed in accordance with a first embodiment of the present invention; and

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Fig. 2 is a schematic view of a system comprising an electronic control arrangement constructed in accordance with a second embodiment of the present invention.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

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Reference is made to FIG. 1 wherein an electronic control arrangement, generally indicated at 10, is constructed in accordance with a first embodiment of the present invention.

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In the preferred embodiment, control arrangement 10 includes at least one control unit or electronic trip unit 20 and a protective device 30, typically a circuit breaker. Control unit 20 provides such functionality as monitoring currents and voltages of the loads for which it is controlling (as further discussed below). Control unit 20 is both mechanically and electrically removably coupleable to protective device 30 in a manner well understood in the art.

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Powering Load L, is a 3-phase power source 40 mechanically and electrically removably coupleable to protective device 30 also arranged in a manner well understood in the art.

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A controller 50, such as a General Electric POWER LEADER™ Power Management Controller, is also electrically and mechanically removably coupleable to control arrangement 10, and in particular, to a controller 52 within control unit 20 via a connection through protective device 30. Controller 50 provides a means of monitoring and communication between and among the control units of the arrangement, as would be well understood in the art.

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Turning now to the particulars of the first embodiment of the present invention, control unit 20 includes, among other features and components known in the art, a removable non-volatile memory module 22. Preferably stored in memory module 22 are the application specific settings for a particular load and control unit, such as load L₁ and/or control unit 20. Such settings may include, for example, protection curves, protection relay function settings, ground fault information as well information (such as addresses for L₁) for effective communication with controller 50 and/or other control units within the system, as well as for effective protection of load L₁. In the preferred embodiment, module 22 mates with a connector within the housing of control unit 20, and may be achieved by conventional plug and socket connectors (not shown) such that upon insertion of memory module 22 in control unit 20 the appropriate connections are made. This arrangement permits memory module 22 to be removably insertable within control unit 20.

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Module 22 may, in addition to the above mentioned information, store information relating to the parameters/characteristics of the protective device 30, control unit 20 and load L₁ with which it is associated, as well as the status of load L₁, protective device 30 and control unit 20. Similarly, module 22 may have stored therein historical information relating to the operational measurements of control unit 20, protective device 30 or load L₁.

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As can be seen in Fig. 1, by way of example, there may be a plurality of control arrangements, each comprised of a respective control unit 20, 24 and 26, with control units 24 and 26 each having a respective removable memory

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module 25, 27 functionally identical to memory module 22. Similarly, each control unit preferably has a respective controller 54 and 56 functionally identical to controller 52 for communicating with controller 50. Each control unit 24 and 26 may also have an associated protective device 32 and 34, and an associated load L_2 and L_3 being protected thereby. It should also now be understood that the disclosed system is comprised of a plurality of control arrangements 10, which is to the left of an interface 60, the aforementioned controller 50, power source 40 and loads L_1 , L_2 and L_3 . Controller 50, power source 40 and loads L_1 , L_2 and L_3 typically remain physically present at a desired location, as opposed to being readily removable and portable as are the control units 20, 24, 26 or protective devices 30, 32, 34.

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As may now be well appreciated, the present invention is significantly more versatile than prior art arrangements. For example, utilizing the present invention provides for a way to reprogram the memory module without the need to physically be the site, since the memory module is now portable within the control units. Moreover, in distinction to the cited prior art, the present invention provides for flexibility in the programming of the memory module.

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That is, in the cited '943 patent, the plant associated memory modules ("PAMMs") are fixed to the motor control center. The present invention is not limited as such since the memory modules are both portable and readily removable from the control unit, which itself is portable. By reason thereof, a memory module in accordance with the present invention can be programmed or reprogrammed at any equipped remote site. Additionally, if the control unit needs replacing due to failure or damage, the replacement control unit can then reprogram itself when memory module 22 with the application specific settings is reinstalled in the new control unit, thereby reducing down time and potential inputting errors. Furthermore, even if the control unit is defective/damaged, the application settings, by virtue of them being stored in the removable memory modules, can be readily recovered.

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Reference is now made to Fig. 2 which illustrates an electronic control arrangement, generally indicated at 100, constructed in accordance with a second embodiment of the present invention, like reference numerals being used on like components.

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In this second arrangement control arrangement 100 may also control a load L_4 , such as a motor, although this too is by way of example and not limitation. Control arrangement 100 also includes at least one control unit or electronic trip unit 120 and a protective device 130, typically a circuit breaker. Control unit 120 also includes a controller 152 for communicating with controller 50 in a manner similar to that disclosed above with regard to controller 52. In all respects except as disclosed below, control unit 120 is functionally similar to control unit 20 and protective device 130 is functionally similar to protective device 30.

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Similarly, there may be a plurality of control arrangements 100, each comprised of a control unit such as control unit 120, 124 or 126, a respective associated protective device 130, 132 or 134, and an associated load L_4 , L_5 or L_6 being protected thereby. Each control unit, such as control unit 124 and 126 includes a respective controller 154 or 156 for communicating with controller 50 in a manner similar to controller 152.

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The significant distinction between the first and second embodiments is that in this second embodiment, each of the control units, such as control unit 120, do not include the aforementioned non-volatile memory module 22, as the memory module, now indicated as 122, is now removably insertable in the corresponding protective device. Each device 130, 132 or 134 has its own respective similarly functional memory module 122, 125 or 127.

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In all other respects, this second embodiment is functionally identical to the construction of the first embodiment and therefore, the specifics thereof need not be repeated. However, it should likewise be appreciated that this second embodiment provides for yet an alternative solution to the aforementioned

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problem, i.e. an effective and efficient means of reprogramming and/or recovering information in the memory modules (at a remote location away from the loads) when either the control unit or protection device fails or is otherwise damaged. Likewise, it should be appreciated that the memory modules, constructed in accordance with the first and second embodiment, may now be programmable while physically removed from the respective control unit or protective device.

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Lastly, it may now be appreciated that the present invention lends itself to heretofore absent rejection methodologies. For example, particular memory modules may be designed for particular control arrangements and utilized only with particularly constructed protection devices or control units. Therefore, different connector arrangements or physical constructions for the memory modules can be provided to ensure correct compatibility with a particular control arrangement.

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It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention described herein and all statements of the scope of the invention which as a matter of language might fall therebetween.

Claims

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CLAIMS

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What we claim is:

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1. A control unit for use in an electronic control arrangement comprising a controller for monitoring the control unit, the electronic control arrangement further comprising a protective device for protecting a load, the control unit comprising:

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communication means for communicating with the controller; and

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a removable non-volatile memory module, the memory module comprising application specific settings storable thereon and associated with the load.

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2. An electronic control arrangement, the electronic control arrangement comprising at least a first and a second control unit, a first protective device associated with the first control unit and a second protective device associated with the second control unit, the first control unit and the first protective device in combination for protection of a first load and the second control unit and the second protective device in combination for protection of a second load, and a controller, couplable to at least the first and second control units, for monitoring status information and communicating to each of the first and second control units, each of the first and second control units comprising:

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communication means for communicating with the controller; and

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a removable non-volatile memory module, the memory module comprising application specific settings stored thereon and associated with the respective load.

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3. The electronic control arrangement as claimed in claim 2, wherein the first control unit is removable from the control arrangement and the memory module associated with the first control unit is removable therefrom, and including a replacement control unit to replace the first control unit in the control arrangement;

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wherein the memory module from the first control unit is insertable into the replacement control unit and the memory module from the first control unit retains all of its application specific settings stored thereon; and

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the replacement control unit in combination with the first protective device provides protection of the first load.

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4. A protective device for protecting a load in an electronic control arrangement, the electronic control arrangement comprising a control unit in connection with a controller for monitoring the control unit, the protective device electrically positionable intermediate the load and a power source, the protective device comprising:

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means within the housing for electrically coupling the power source with the load;

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a removable non-volatile memory module, the memory module comprising application specific settings storable thereon and associated with the load.

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5. A control unit as claimed in claim 1, where the memory module is programmable while physically removed from the control unit.

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6. A protective device as claimed in claim 4, wherein the memory module is programmable while physically removed from the protective device.

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7. The control unit as claimed in claim 1, where in the memory module is particularly shaped to be insertable into the control unit.

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8. The protective device as claimed in claim 4, wherein the memory module is particularly shaped to be insertable into the protective device.

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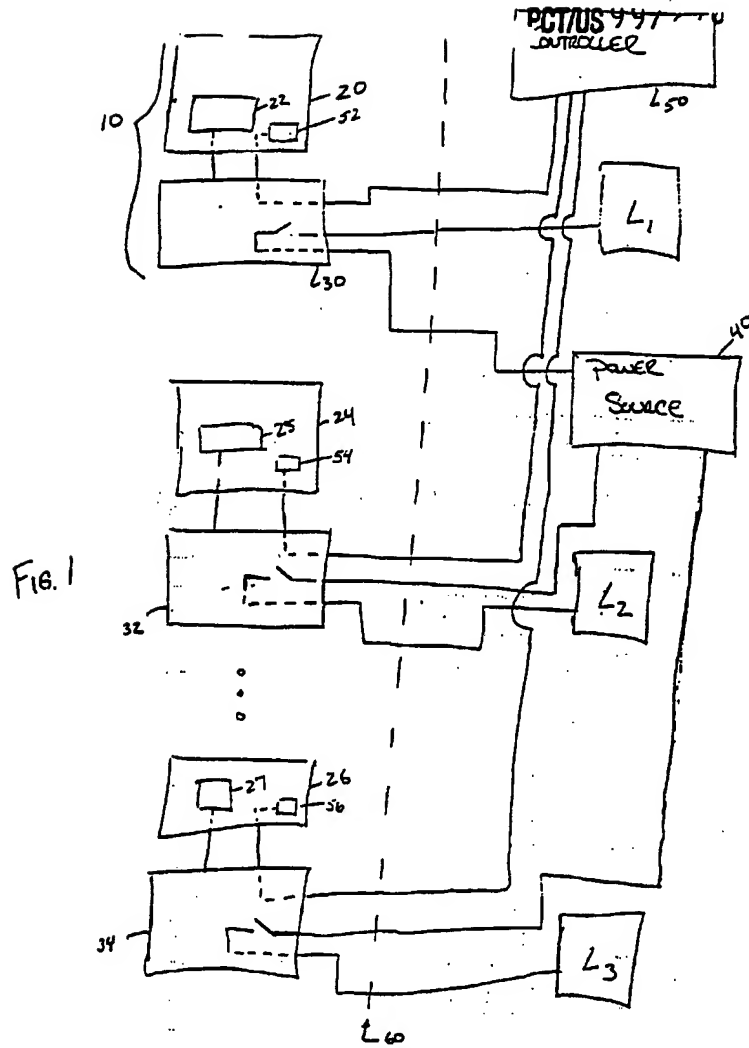
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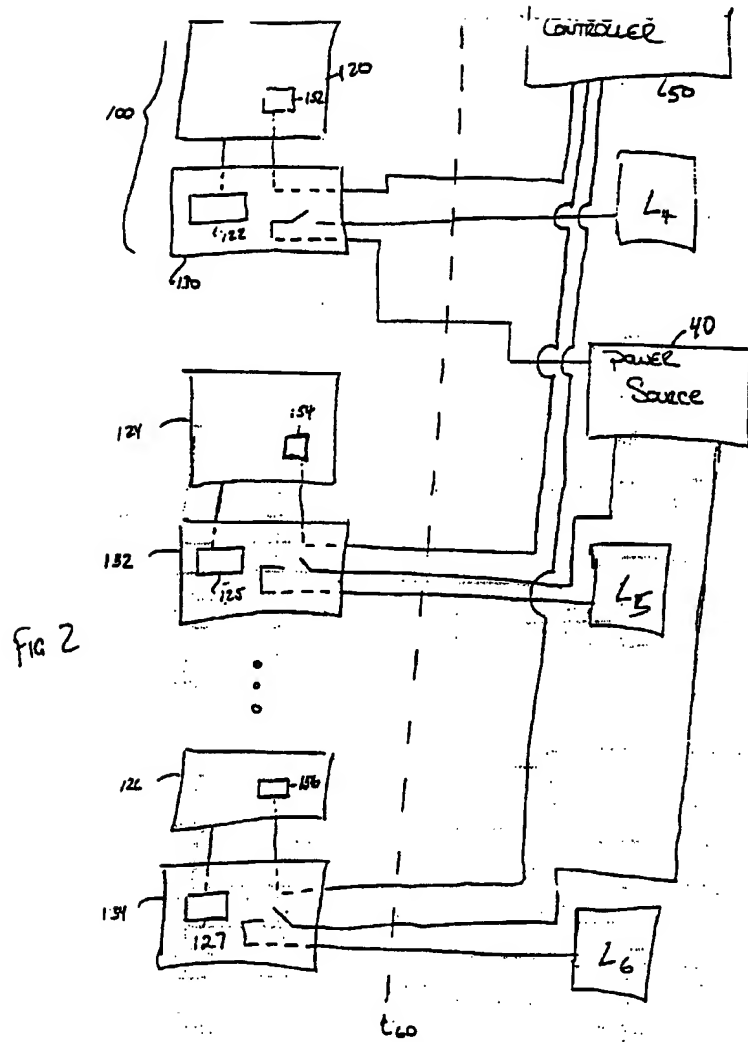
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INTERNATIONAL SEARCH REPORT

Int. Appl. No.
PCT/US 99/29084A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G05B19/042

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 672 943 A (VIVERS PETER) 30 September 1997 (1997-09-30) cited in the application the whole document	1-8
Y	DE 297 06 969 U (INVENTIO AG) 17 July 1997 (1997-07-17) the whole document	1-8
A	US 5 367 427 A (MATSKO JOSEPH J ET AL) 22 November 1994 (1994-11-22) the whole document	1-8
A	US 5 437 163 A (JUREWICZ ROMUALD M ET AL) 1 August 1995 (1995-08-01) the whole document	1-8

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

15 May 2000

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5672943	A	30-09-1997	CA 2139102 A DE 69419861 D DE 69419861 T EP 0647335 A WO 9425906 A GB 2277621 A, B	10-11-1994 09-09-1999 05-01-2000 12-04-1995 10-11-1994 02-11-1994
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